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Costa Rican Frogs of the Genera *Centrolene* and *Centrolenella*

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ABSTRACT.—Four species belonging to the genera *Centrolene* and *Centrolenella* have been recognized in the Fauna of Costa Rica. These are *Centrolene prosoblepon* (Boettger), *Centrolenella pulveratum* (Peters), *Centrolenella valerioi* (Dunn), *Centrolenella fleischmanni* Boettger. Four forms are described as new in the genus *Centrolenella*. These are *C. spinosa*, *C. granulosa*, *C. albomaculata* and *C. colymbiphyllum*, all from Costa Rica.

Twenty-five specimens of small, green, hylid frogs taken in Costa Rica in the summer of 1947, resolve themselves into a group of species, one of which is referable to the genus *Centrolene*, since a humeral protuberance is present, and the others to the genus *Centrolenella* in which the protuberance or hook is absent. One of the species possesses a rudiment of a pollex with a sharp spine usually penetrating the free tip. While I am inclined to regard this development as worthy of generic designation, I am for the present referring the species to *Centrolenella* pending further research in the matter.

Three species have already been described from Costa Rica. These are *Hyla prosoblepon* Boettger, in 1892, from Plantage Cairo (La Junta) near Limón, Atlantic side of Costa Rica; Carl Fleischmann collector; *Hylella fleischmanni* Boettger, in 1893, from San José, Costa Rica, Carl Fleischmann collector; and *Centrolene valerioi* Dunn, in 1931, from La Palma, Costa Rica, Manuel Valerio and E. R. Dunn collectors. A fourth species has been reported in Costa Rica. This is *Hyla pulverata* Peters, described in 1873, from Chiriqui, Panamá, H. Ribbe, collector. The present designations of the four species occurring in Costa Rica are: *Centrolene proseblepon*

(Boettger), *Centrolenella pulveratum** (Peters), *Centrolenella valerioi* (Dunn) and *Centrolenella fleischmanni* (Boettger).

A free translation of the original description of *Hyla pulverata* Peters follows:

Vomerine teeth in two groups between the choanae which are much larger than the small openings of the Eustachian tubes. Tongue scarcely emarginate behind. Snout, not longer than the eye, with a rounded canthus rostralis. Tympanum round, very small, and covered over with pigmented skin. Back smooth, the belly and underside of thigh granular; first and second fingers apparently equally long, much shorter than the fourth; first finger entirely free; the web between the second and third fingers reaches almost to the terminal pads of the second and somewhat over the base of the first joint of the second; between the third and fourth from the terminal disk of the fourth to the middle of the penultimate phalanx of the third. The toes are bound with a complete web which leaves only the two outer joints of the fourth toe free.

Colorless, with scattered small white punctations which are numerous on the side of the head. Under a lens the surface is seen to be punctate with dark flecks.

Total length in mm., 24; head, 9; head width, 8; arm, 15; hand, with third finger, 8; leg, 45; foot and fourth toe, 20.

One specimen from Chiriqui, from H. Ribbe. This species in its form and tooth arrangement is nearest *H[yla] rodopepla*, while its color recalls *H. punctata* and *albomarginata*. The very well-developed web between the fingers and the very small tympanum without a skinfold over it serves to separate them easily.

I have not been able to recognize this species in any of my Costa Rican material. Among the specimens at hand are several species, which do not conform to either structures or color of the described forms and I conclude that they represent undescribed species, and are here described.

Centrolene prosoblepon (Boettger)

Hyla prosoblepon Boettger, Katalog der Batrachier—Sammlung in Museum der Senckenbergischen Naturforschenden Gesellschaft in Frankfurt am Main, Aug., 1892, p. 45. (Type locality, Plantage Cairo [La Junta], near Limón, Atlantic side of Costa Rica): Günther, Biologia Centrali-Americana, Reptilia and Batrachia, Sept., 1901, p. 280.

?*Hyla puncticus* Boulenger, Ann. and Mag. Nat. Hist., ser. 6, vol. 18, 1896, p. 341.

Centrolene prosoblepon Noble, Proc. Biol. Soc. Washington, vol. 37, 1925, pp. 66-71.

A series of eight specimens from Isla Bonita (The American Cinchona Plantation), display varying shades of lavender, and different degrees of spotting.

* There is some doubt as to whether there is a humeral hook present in *pulveratum*. Peters makes no mention of this organ. This of course may be accounted for if the type is a female—a strong probability since the vocal sac is not mentioned either.

Dunn, 1931b, who believes he has recognized this form in specimens from El Valle de Antón and in Costa Rica, states that "a rudimentary humeral hook, not projecting" is present; and later Dunn (1933) in listing characters of the form, states "male and female without humeral hook." I am presuming that the last statement is correct, and am referring the species to *Centrolenella*.

Two females, the largest specimens, have the darkest shade of lavender. The exposed surfaces of the back and limbs have small, rounded, purplish or purplish-brown spots. The males, which on the whole are of a lighter shade of lavender, have the spotting similar to that in the females in two specimens, while in four the spots are fewer in number and confined to the rump and dorsal surfaces of the limbs.

The largest male, with a very well-developed humeral process, has no trace of vomerine teeth but they are present in all other specimens. The two females show no trace of the humeral process.

Noble and Dunn both report that the humeral process is present in certain females of a species they identify as *Centrolene prosoblepon*. One wonders whether there is an unrecognized species in Central America in which this is a constant character in females or whether the so-called females with the humeral process represent some type of intersex.

The measurements of the type, as recorded in the type description, is appended to the following table of measurements. It may be noted that the measurement of the arm of the type is considerably smaller than that of specimens of smaller snout-to-vent measurement in this series; the leg is slightly smaller, the head length a little shorter, and the head width a little greater.

The type is from near sea level while the specimens listed here come from an elevation of about 5,500 ft. on Volcán Poas. Whether or not direct comparison with the sea level population would reveal other significant differences cannot be stated.

Centrolene prosoblepon Boettger

		Total length	Head length	Head width	Arm	Hand and fingers	Leg	Foot and toe	Tibia	Femur
23806	♀	27.5	9	9.5	18	8.5	46	20	15	15
793*	♀	26.5	9	9.8	16	10	46.2	20	15.2	15
2922	♀	26.5	8.4	9.2	18	8	46	19	14.6	13
23804	♂	26	8.3	9	17	8	46	19.4	14.6	13
2926	♂	25	8.3	9	17	8	46	19	14.4	14
23803	♂	25	8.2	9	16	8	45	19	14.2	13.8
23805	♂	24	8	8.5	17.5	7.9	43	19	14	12.8
794	♂	23.4	7.9	8.5	17	7.8	43	19	14	13
Type		24.5	7.5	9	14.5	...	42

* Nos. 793, 794, 2922, 2926 are field numbers of R. C. Taylor.

Centrolenella spinosa sp. nov.

Type: University of Kansas Museum of Natural History no. 23809 ♂. Collected at Los Diamantes, one mile south of Guápiles, Costa Rica, Sept. 7, 1947, by Richard C. Taylor and Edward H. Taylor.

Paratypes: Nos. KU 23810, KU 23811; RCT 2467-2469 (all males). Same locality and collectors. Sept. 7-8, 1947.

Diagnosis: A small species (about 21 mm.); snout high, the front edge nearly vertical; nostril near front edge of snout. Vomerine teeth very weak, usually present; tympanum present; skin minutely rugose but not granular on back and sides; a well-defined pollex rudiment bearing a sharp spine which may or may not be exposed; lavender without any spotting; eyelids purple; iris silver with purple reticulation; inner toe narrowed at tip.

Description of the type: Head broader than the body; eyes prominent, directed somewhat forward; canthus rostralis apparent, very much rounded; areas about nostrils much swollen with a distinct medial depression between them; loreal region with a long slope to lip, the medial area behind nostril slightly concave; snout in front of nostrils nearly vertical, the nostrils much nearer median point of upper lip than eye; interorbital width greater than the length of snout, one and three fourths times width of an eyelid; tympanum present, its greatest diameter about one and three fourths times in its distance from eye, almost three times in longitudinal diameter of eye; a rather marked constriction of head behind tympanum, with a somewhat swollen area above arm insertion; supratympanic fold obsolete; tongue rather rounded with a scarcely discernible notch behind, free behind for about one fifth its length; openings to vocal sacs are elongate curved slits beginning along sides of tongue and extending some distance behind; choanae large, round, the diameter of one contained in distance between them three times; external vocal sac forming ample folds on chin.

Upper arm very slender, the forearm greatly thickened with an indistinct flattened skin fold on under surface; only a faint trace of web between the first and second fingers; a small but distinguishable web between the second and third with a moderate fringe reaching terminal pad on outside of second finger; third and fourth fingers about half webbed, the web not reaching the level of the outer subarticular tubercles; finger widened at tips, and more or less truncate; first finger much longer than second with a distinct rudiment of pollex, free at tip, with a sharp, strong spine (possibly absent in female; none seen); pollex surrounded by the elongate palmar tubercle; a strongly-defined rounded median palmar tubercle; subarticular tubercles well defined and numerous; supernumerary tubercles present; legs long, the tibiotarsal articulation

reaching slightly beyond snout tip when limb is adpressed; the heels touch but do not overlap; foot a little more than three fourths webbed, the terminal pads smaller than those on fingers, the outer somewhat truncate, that on inner toe somewhat pointed, scarcely or not as wide as toe; moderate inner metatarsal tubercle elevated but little; apparently no trace of an outer tubercle; subarticular tubercles small, supernumerary tubercles not or scarcely discernible; inner tarsal fold very weak, scarcely discernible; anal opening high on rump covered by a free flap, the transverse free edge much longer than width of flap.

Skin on back and sides seen under a lens, minutely rugose, but definitely not granular; belly and under side of thigh strongly granular, the granules of the latter much the larger.

Color: In life, yellow green except concealed surfaces of arm, leg, and under side of body which are flesh white, and transparent, without markings; a large light cream spot in front of arm insertion. In preservative (formalin, then alcohol) the dorsum nearly uniform lavender, the eyelids deep purple; limbs lighter but with a fine peppering of lavender chromatophores on the exposed surface, even on most of upper surface of the thigh; below and on concealed surfaces pure white without pigment; iris of eye silver with purple venation; upper lip white.

Measurements in mm.: Snout to vent, 20; width of head, 7; arm, 13; leg, 35.5; axilla to groin, 10.2.

Variation: The five paratypes are all males and agree with the type in essential details, such as in the constriction on sides of head behind the tympanum, forward position of nostril, and the narrow tips of inner toes; the vomerine teeth appear to be present in all but are completely transparent and scarcely discernible save under high magnification.

The spine of the pollex is transparent, sharp and in certain cases does not seem to have pierced the surface of the skin. I presume that this serves as a "grasping" organ in mating and that the spine pierces the skin surrounding it during this act. If it is present in the female it will probably be found to be much reduced. The base of the first finger lacks nuptial asperities although one can discern a group of small spherical glands below the skin in the region where they normally occur in certain other species.

This form stands in relation to *Centrolenella* much as *Plectrophyla* does to *Hyla*, and probably merits a generic designation. However, the pollex character may be present but overlooked in certain species

referable to the group, and a generic name may already be available. Until this is ascertained I shall leave it in *Centrolenella*.

Centrolenella colymbiphyllum sp. nov.

Type: University of Kansas Museum of Natural History, no. 23812 collected at the American Cinchona Plantation, elev. 5,600 ft., Caribbean drainage of Volcán Poas, Costa Rica, July 29. Richard C. Taylor and E. H. Taylor collectors.

Paratypes: Nos. RCT. 790-791. Same data as type.

Diagnosis: Tympanum moderately distinct, its diameter in diameter of eye at least 2.5 times; width of an eyelid in narrowest interorbital width 1.25 times; frontal region shallowly concave, the areas about nostrils strongly swollen with a depression between; canthus indistinct, concave; skin below anal opening forming vertical folds extending under thigh; tibiotarsal articulation 2 mm. beyond snout; terminal disks of hand wider than digits, fingers less than one half webbed; choanae large, the diameter of one contained in distance between them slightly less than two times; no trace of humeral process; no free pollex rudiment; vomerine teeth absent.

Description of type: Adult male; vocal sac forms ample folds on chin and throat. Head a little broader than the body; eyes prominent, directed forward; rounded outline of jaw seen from above interrupted by snout which extends a little farther forward than edge of mouth; interorbital width small, about one fourth greater than width of an eyelid, slightly greater than distance between eye and nostril; frontal region slightly concave; the canthus rostralis indistinct, strongly concave; lores oblique, not or but very slightly concave; nostril distinctly nearer median edge of lip than eye; a distinct depression between the swollen areas of nostrils; eye purplish black, the color showing through eyelids so they appear dark. Lower part of tympanum distinct, largely directed upward but apparently covered with thin slightly pigmented skin, the inner edge more heavily covered.

Tongue subcircular, more or less emarginate on posterior edge, free only for about one sixth of its length; openings to vocal sac elongate slits extending along sides of tongue and somewhat behind; choanae very large, their diameter slightly more than half distance between them; vomerine teeth absent.

Upper part of arm very slender, forearm thickened with a strong fold on its outer edge, without a thin flap indicated at elbow; median palmar tubercle very distinct; inner tubercle rather indistinct, lack-

ing nuptial rugosities but with the minute glandules visible under the skin; toes broad, terminal disks distinctly wider than digits, the width of outer finger disk equal to half eye diameter; outer fingers little more than one third webbed; a trace of web between first two fingers. Leg elongate, the tibiotarsal articulation reaching 2 mm. beyond tip of snout; heels barely touch when legs are folded at right angles to the body; a flat rather large inner metatarsal tubercle; outer tubercle if present very indistinct; toes nearly three fourths webbed except that first two have webs extending scarcely half their length.

Skin not granular, but under lens some minute elevations visible, each with a medial depression suggesting a crater; chin and throat smooth; abdomen areolate; a very small areolate area on under surface of thigh; skin below anus forming vertical folds, noticeable when femurs are at right angles to body.

Color: In life, uniform bright yellow green on back and sides, with dim suggestions of cream flecks; on ventral surfaces whitish, semitransparent; tips of toes yellowish. In preservative (formalin transferred to alcohol), nearly white with numerous star-shaped chromatophores and indications of small rounded areas without pigment; under surfaces flesh-white without pigment; a very narrow line of chromatophores on dorsal surface of thigh.

Measurements in mm.: Snout to vent, 26; head length, 7.8; arm, 18; leg, 43.

Variation: The two paratypes taken at the same time and place differ negligibly, save that the tympanum is a little smaller and a little less distinct, and the tibiotarsal articulation reaches only to the tip of the snout. The measurement variations are given in the following table:

Centrolenella colymbiphyllum sp. nov.

No.	Total length	Head length	Head width	Arm	Hand and fingers	Leg	Foot and toe	Tibia	Femur
791	26	7.8	9.5	18	8	46.2	20	15	13.7
790	25.8	8	9.2	18	8	43	18.8	13	12.8
23812	25	7.4	9	16.5	7.7	44	19	13.8	13.5

Remarks: *Centrolenella albomaculata* differs from this form in having the snout less protruding, the hand more than half webbed, the feet four fifths webbed, the vomerine teeth present, and the nostril closer to the eye. The dorsal color is lavender dotted with numerous cream spots. The eyelid is purplish black.

Centrolenella granulosa differs in having the dorsum strongly granular, the nostrils closer to the eye than middle edge of lip, the

snout sloping obliquely in front of the nostrils, the vomerine teeth present and the choanae much farther apart. The webbing on hand and foot is distinctly greater.

Centrolenella valerioi differs in having a very small tympanum (one sixth the eye diameter), and the interorbital space twice width of an eyelid.

C. fleischmanni differs in having the eyelid golden, the under surface of the thigh very strongly areolate on the entire under surface, a distinct outer metatarsal tubercle present, choanae farther apart, and the frontal area not concave. Both species have the vomerine teeth absent and the degree of webbing about the same.

The character of the pollex in *C. spinosa* distinguishes that form from all other members of the genus.

The presence of vomerine teeth, numerous white punctations below the eye and the granulation of the underside of the thigh distinguishes *C. pulveratum*.

The specimens were collected at night from leaves of plants growing in a small mountain stream. They appeared to be very wary and numerous individuals dived into the water and escaped. In the same identical habitat a series of *Centrolene prosoblepon* were taken. These were apparently less wary and more easily captured.

There is a vague possibility that *C. colymbiphyllum* is identical with Boulenger's *Hyella puncticrus* that has been synonymized with *Centrolene proseblepon* by Neiden (1923).

Centrolenella fleischmanni (Boettger)

Hyella fleischmanni Boettger, Ber. Senck. Naturf. Gesells., 1893, pp. 251-253. (Type locality, San José, Costa Rica.)

Centrolenella fleischmanni Noble, Proc. Biol. Soc. Wash., vol. 37, 1924, p. 69 (combination suggested).

Three typical specimens are from the environs of Cartago, Costa Rica. They were taken from low branches above flowing water on a rainy evening.

Centrolenella valerioi (Dunn)

Centrolene valerioi Dunn, Occ. Papers Boston Soc. Nat. Hist., vol. 5, 1931, pp. 397-399. (Type locality, La Palma, Costa Rica.)

A single specimen was obtained at El General, Costa Rica, clinging to a leaf of a plant growing in the mire about a small spring. The dorsal color in life was green with some slightly reticulated lighter green markings. The eye was golden.

In preservation the specimen is nearly white, peppered with fine purplish flecks; the area above the eye is cream white but bearing purplish flecks; the pupil is gray and lavender.

The specimen measures 20 mm. snout to vent; width of head, 7.5 mm.; arm, 13 mm.; leg, 32 mm.

The tympanum is visible but covered with skin and measures approximately $1/5$ of the diameter of the eye.

It bears considerable resemblance to *Centrolenella fleischmanni*, but the arms and legs are proportionately longer and the tympanum is present.

Centrolenella granulosa sp. nov.

Type: R. C. T. no. 2463. Collected at Los Diamantes one mile south of Guápiles, Costa Rica, Sept. 7, 1948, by Richard C. Taylor.

Paratype: University of Kansas no. 23802. Collected with the type; same collector.

Diagnosis: A rather large species of the genus (28 mm.) with strongly granular skin on head, back and sides of body, dorsal part of limbs, venter and undersurface of thighs. Large vocal sac, its surface rugose. Web on outer fingers extending beyond level of the two outer subarticular tubercles; between second and third fingers, $1/5$ webbed with broad fringe on outer side of second finger; scarcely a trace of web between first and second; nuptial asperities on thumb; large inner, very small outer metatarsal tubercle; no projecting rudiment of a pollex; tibiotarsal articulation 2 mm. beyond tip of snout; nostrils equidistant from eye and median tip of snout; eyelid purple, body (in alcohol) creamy white with numerous scattered purple or lavender spots.

Description of type: Head broader than body, the eyes strongly protruding, directed somewhat forward, the pupil horizontal; canthus rostralis distinct, slightly rounded; area about nostrils somewhat elevated with a slight depression between them; in front of nostril, snout slopes forward and down to edge of lip; loreal region sloping more gradually to lip; interorbital distance about 1 to $1\frac{1}{2}$ times width of eyelid; tympanum present, its diameter practically three times in longitudinal diameter of eye; a supratympanic fold from eye to near insertion of arm.

Tongue cordiform, slightly notched behind; opening to vocal sacs are curved slits reaching from level of middle of tongue to considerable distance behind tongue; choanae large, circular, the diameter of one contained in distance between them four times; two very indistinct vomerine ridges between choanae, each bearing two or three vomerine teeth.

Fingers short and broad, the tips dilated, that of fourth finger one half diameter of eye; a mere trace of web between first and second fingers; about one fourth to one fifth webbed between second and third but a rather distinct fringe reaches to terminal pad on outer side of the second; between third and fourth a little more than two thirds webbed, a fringe reaching terminal pad on outer side of third finger; subarticular tubercles well defined; a large, very distinct oval palmar tubercle; large tubercle at base of first finger bearing colorless nuptial asperities which extend much beyond tubercle and across the dorsal surface; a strongly defined fold on underside of forearm.

Legs long, the heels overlapping little more than two millimeters; tibiotarsal articulation extends beyond tip of snout about two or three millimeters; toes three fourths to four fifths webbed; subarticular tubercles distinct, rather large; a strong inner metatarsal tubercle; and a very small outer; a very slight, scarcely distinguishable inner tarsal fold.

Granulations on skin strongly defined on back, sides, head, and to a lesser extent on surface of forearm and lower part of leg and foot; on throat and chin, skin rugose but apparently not granular; venter and the greater part of underside of thigh, strongly areolar or granular, the granules being very much larger than those on back; those under the thigh distinctly larger than those on venter; a narrow, but relatively long transverse free flap covers anal opening.

Color: In life, leaf green with some slightly darker areas evident; below transparent white or flesh; in preservative (formalin transferred to alcohol) color cream flesh with a very faint wash of lavender with numerous (about 40) small purple spots; under a lens the lavender wash is seen to be caused by very numerous, small chromatophores. All ventral surfaces, and much of the lateral surfaces of limbs and body, cream-white lacking pigment; eyelids purple; eyes silver with some purplish reticulation.

Measurements in mm.: Snout to vent, 28.2; width of head, 10; axilla to groin, 16; arm, 18; leg, 49.

Variation: The paratype is somewhat more lavender than the type. The dorsal spots are smaller and more numerous on the back and on the tibia. The iris of the eye is darker; the vomerine tooth patches are more distinct. Otherwise the two agree in all essential details.

Remarks: The absence of a humeral hook or process places this species in the genus *Centrolenella* Noble. Noble regarded the ab-

sence of vomerine teeth a character of the genus. However the teeth are not invariably present. The teeth may be absent in some individuals of a species and present in others.

The position of the nostril, halfway between eye and the median tip of snout, the purple eyelid, the very granular skin, the longer leg, presence of a tympanum, absence of a pollex rudiment, and the markings, will together distinguish this form from other species of *Centrolenella*.

The specimens were taken at night on small trees growing on the edge of a small river.

Centrolenella albomaculata sp. nov.

Type: University of Kansas Museum of Natural History no. 23814. Los Diamantes, one mile south of Guápiles, Costa Rica, Sept. 7, 1947, E. H. Taylor and Richard C. Taylor, collectors.

Paratype: R. C. T. no. 2020. Same date, locality, and collectors.

Diagnosis: A rather large sized species of the genus (27 mm. snout to vent); tympanum distinct, nostrils slightly closer to eye than to median point of snout at tip; interorbital distance equal to width of eyelid; heels overlapping; tibiotarsal articulation 4-5 mm. beyond tip of snout; toes five sixths webbed, the membrane touching the terminal expansions on one side or other of all toes, save fourth; a distinct web present at base of first and second fingers; posterior part of back slightly but indistinctly granular; vomerine teeth strongly developed in two ridges near posterior level of choanae. No pollex rudiment; purplish lavender with numerous cream spots on all unconcealed dorsal surfaces.

Description of type: Head a little wider than body, the eyes large, protruding, their diameter equal to their distance from tip of snout; areas about nostrils strongly swollen, with a strong depression between and somewhat behind them; canthus rostralis wanting; in front of nostrils the snout slopes to the edge of lip at an angle distinctly greater than slope of loreal region; lores distinctly concave; tympanum small, its greatest diameter contained in distance from eye one and three fourths times, and in the longitudinal diameter of eye a little more than three times.

Tongue rather rounded, not or but very slightly emarginate posteriorly, free for about one fifth its length; opening of vocal sacs elongate, curved slits lying partly at side of tongue and extending some distance behind; choanae large, their diameter contained in space between about three times; vomerine teeth in two raised

patches lying between the posterior level of choanae and extending somewhat behind this level; (in paratype not reaching posterior level of choanae).

Digits short, widened at the tips, that of third finger a little more than one half eye diameter; a very narrow web between first two fingers; second and third fingers one third webbed, the web extending as a fringe to the terminal expansion on outer side of second finger; third and fourth toes two thirds webbed, the web extending beyond level of subarticular tubercles; latter strongly developed; an elongate pad at base of first finger and very distinct palmar pad at base of wrist; base of first finger with an area of nuptial asperities; supernumerary tubercles indistinct; upper arm slender, forearm thickened with a well-developed fold on under side; legs long and slender, the tibiotarsal articulation extending several millimeters beyond tip of snout when leg is adpressed to body; heels overlap 2.2 mm.; toes four fifths webbed, the web reaching the terminal pad of each toe on one side, except fourth; terminal pads truncate, that of inner toe rather pointed; a rather large inner metatarsal tubercle, rounded anteriorly, the tip slightly free; outer, if present, very indistinct; subarticular tubercles well developed; some distinct supernumerary tubercles; inner tarsal fold scarcely indicated.

Skin with some indistinct granulation on posterior part of back; slightly rugose anteriorly and on sides of body; upper surface of limbs also slightly rugose; throat and breast smooth; abdomen granular as is the greater part of under side of thigh; an enlarged granule on each thigh medially; segmentation of abdominal muscles distinctly indicated on venter; a small free flap over anal opening.

Color in life: Yellow green on all exposed surfaces, with indications of small cream dots; all concealed surfaces creamy white nearly transparent; in preservative (formalin transferred to alcohol) purplish to dark lavender above, somewhat lighter on the upper surface of limbs with very numerous rounded cream spots or punctations, somewhat larger on hind limb than on back; venter and under surface of limbs cream white; eyelids dark purple with white flecks; iris purple with minute silver flecks; some white flecks in tympanic and anal regions.

Measurements in mm.: Snout to vent, 26; width of head, 9; arm, 19; length of hind limb, 50; axilla to groin, 14.

Variation: The single paratype collected in the same locality with the type agrees in all essential details save that the vomerine

teeth are somewhat farther forward; and outer metatarsal tubercle is indicated. The color has been somewhat changed due to rust in the preserving fluid.

A key to the recognized species (for preserved material) is here given:

1. Humeral hook in males; color lavender with numerous small purple spots and minute chromatophores; nostrils far forward, nearer median edge of lip than eye; tympanum distinct; type 24.5 ♂; greatest length, 27.5 ♀...*Centrolene prosoblepon*
No humeral hook in males..... 2
2. A rudiment of a pollex present, free at tip, terminating in a sharp firm spine in males, condition in females not known; skin of back and sides under lens minutely rugose but not granular; snout nearly vertical in front, nostrils nearer median point of lip than eye; lavender with neither light nor dark spots (females not known); vomerine teeth present; length, 21 mm. ♂...*Centrolenella spinosa* sp. nov.
No free rudiment of pollex bearing spine..... 3
3. Tympanum concealed; vomerine teeth absent; nostrils not elevated; color cream-flesh, unspotted but with numerous lavender or purple chromatophores visible under lens; upper eyelid golden yellow or creamy yellow...*Centrolenella fleischmanni*
Tympanum not concealed; vomerine teeth present or absent..... 4
4. Tympanum minute, one sixth of eye diameter or "very small"..... 5
Tympanum larger, at least one-third of eye diameter..... 6
5. No vomerine teeth present; first finger longer than second; canthus distinct but rounded; outer fingers about one-half webbed; interorbital space twice width of an eyelid; heel reaches beyond snout; skin smooth above; white with a few faint dark [purplish?] chromatophores; type, 21 mm.; sex not mentioned. (Said to reach 26 mm.)*Centrolenella valerii*
Tympanum very small covered with pigmented skin; vomerine teeth present; back smooth; first and second fingers equally long; outer fingers about ½ webbed; toes except fourth nearly completely webbed; colorless with scattered small punctations, numerous on the side of head.....*Centrolenella pulveratum*
6. Vomerine teeth absent; skin lacking granules on back; nostril much nearer median edge of lip than eye; interorbital space one fourth wider than an eyelid; outer fingers less than half webbed; diameter of choanae in distance between choanae minutely less than two times.....*Centrolenella colymbiphyllum*
Vomerine teeth present; dorsal skin more or less granular; nostril nearer eye than median edge of lip 7
7. Skin strongly granular above; nostrils nearer eye than tip of snout; tip of snout oblique, not vertical; vomerine teeth weakly developed; white or slightly lavender with numerous purple spots, and finely scattered lavender chromatophores; outer fingers two thirds webbed; eyelid deep purple; 28 mm. ♂.....
Centrolenella granulosa sp. nov.

Skin weakly granular on posterior part of back, somewhat rugose anteriorly and on head; vomerine teeth strongly developed; tibiotarsal articulation 4-5 mm. beyond snout; interorbital width equal to width of eyelid; diameter of tympanum in eye diameter a little more than three times; nostril minutely nearer eye than lip; lavender above, with numerous cream spots on all exposed surfaces; type, 27 mm.*Centrolenella albomaculata* sp. nov.

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